

## CLAIMS

1. A method for transmitting Ethernet service signals in a Wavelength Division Multiplexing (WDM) network, comprising:
  - a Center Server (CS) receiving the Ethernet service signals and transmitting the signals to a transmission channel for transmission;
  - a receiving station receiving the Ethernet service signals from the transmitting channel, performing a space-division cross operation upon the received signals and duplicating the signals into two copies, wherein one copy is locally downloaded and the other copy is returned to the transmission channel for continuous transmission.
2. The method according to claim 1, wherein,
  - the CS transmits the Ethernet service signals in any direction of the transmission channel or in both directions of the transmission channel simultaneously; and
  - each receiving station receives the Ethernet service signals from any direction of the transmission channel or from both directions of the transmission channel simultaneously.
3. The method according to claim 2, further comprising:
  - each station implementing a protection switch by switching the directions of receiving and transmitting the Ethernet service signals.
4. The method according to claim 1, wherein, the step of duplicating is implemented by a space-division cross module.
5. The method according to claim 1, wherein, the duplication is implemented by a Media Access Control (MAC) layer according to a MAC layer label and the a pre-configured forwarding table, or the step of duplicating is implemented by a network identifier module according to a self-defined identifier added to the Ethernet service signals and the pre-configured forwarding table.

6. The method according to claim 1, further comprising:  
when the CS receives multiple Ethernet service signals at the same time,  
the CS determining that the Ethernet service signals carry different MAC layer labels respectively; informing the receiving station of the MAC layer labels carried in each Ethernet service signal; and transmitting the multiple Ethernet service signals to the transmission channel; and

the receiving stations receiving the multiple Ethernet service signals, selecting the signals belonging to the present station from the locally downloaded multiple Ethernet service signals to receive and discarding signals not belonging to the present station according to the MAC layer labels.

7. The method according to claim 2, further comprising:  
when the CS receives multiple Ethernet service signals at the same time,  
the CS determining that the Ethernet service signals carry different MAC layer labels respectively; informing the receiving station of the MAC layer labels carried in each Ethernet service signal; and transmitting the multiple Ethernet service signals to the transmission channel for transmission; and

the receiving stations receiving the multiple Ethernet service signals, selecting the signals belonging to the present station from the locally downloaded multiple Ethernet service signals to receive and discarding signals not belonging to the present station according to the MAC layer labels.

8. The method according to claim 6, wherein: the MAC layer label is a Virtual Local Area Network (VLAN) label, or a Multiple-Protocol Label Switching (MPLS) label or a Resilient Packet Ring (RPR) label.

9. The method according to claim 1, further comprising:  
when the CS receives multiple Ethernet service signals at the same time,  
the CS adding an identifier of the station that receives the service signals into each Ethernet service signal; correspondingly informing each receiving station of the identifier; and transmitting the multiple Ethernet service signals to the transmission channel for transmission;  
the receiving station receiving the multiple Ethernet service signals, selecting the signals belonging to the present station from the locally downloaded multiple Ethernet service signals to receive and discarding the signals not belonging to the present station according to the identifier information; and peeling the identifier information from the signals of the present station.

10. The method according to claim 2, further comprising:  
when the CS receives multiple Ethernet service signals at the same time:  
the CS adding the identifier of the station that receives the service signals into each Ethernet service signal; correspondingly informing each receiving station of the identifier; and transmitting the multiple Ethernet service signals to the transmission channel for transmission;  
the receiving station receiving the multiple Ethernet service signals, selecting the signals belonging to the present station from the locally downloaded multiple Ethernet service signals to receive and discarding the signals not belonging to the present station according to the identifier information; and peeling the identifier information from the signals of the present station.

11. A device for transmitting Ethernet service signals in a Wavelength Division Multiplexing (WDM) network, comprising:

transmitting/receiving modules, which connect to transmission channels in the WDM network;

a local service processing part, which connects to a user side; and

a space-division cross module, connected with the transmitting/receiving module and the local service processing part, and is used for performing a space-division cross operation upon the Ethernet service signals and duplicating the Ethernet service signals;

wherein, the Ethernet service signals at network side received by transmitting/receiving module are duplicated by the space-division cross module into two copies, wherein one copy is transmitted to the local service processing part and the other copy is returned to the network side for continuous transmission.

12. The device according to claim 11, wherein, the local service processing part comprises a Media Access Control (MAC) layer and a physical layer, wherein, the MAC layer connects to the space-division cross module and the physical layer, selects the services that belong to the present station and to receive according to MAC layer labels, and discards other services.

13. The device according to claim 11, further comprising:

a network identifier module, connected with the space-division cross module and the local service processing part, and is used for adding identifiers to the Ethernet service signals, selecting services that belong to the present station to receive according to the added identifiers, and peeling identifier information of the Ethernet service signals that belong to the present station.

14. The device according to claim 11, further comprising:  
an Ethernet service signal encapsulation module and a mapping/framing module,  
which connect to the cross module and the transmitting/receiving modules.

15. A device for processing Ethernet service signals in a Wavelength Division Multiplexing (WDM) network, comprising:  
a transmitting/receiving module, which connects to transmission channels of the WDM network;  
a Media Access Control (MAC) layer that connects a user side; and  
a space-division cross module, connected with the transmitting/receiving modules and the MAC layer, and is used for performing a space-division cross operation upon the Ethernet service signals;

wherein, the MAC layer is used for duplicating the Ethernet service signals from the space-division cross module into two copies, wherein one copy is transmitted to a local station while the other copy is returned to the transmission channel of the WDM network through the space-division cross module and transmitting/receiving module.

16. The device according to claim 15, wherein, the MAC layer is further used for selecting service signals that belong to the present station to receive according to MAC layer labels in the Ethernet service signals, and discarding other service signals from the space-division cross module which do not belong to the present station.

17. The device according to claim 15, further comprising:  
an Ethernet service signals encapsulation module, a mapping/framing module, which connect the cross module and the transmitting/receiving module.

18. A device for processing Ethernet service signals in a Wavelength Division Multiplexing (WDM) network, comprising:

a transmitting/receiving module, which connects to transmission channels in the WDM network;

a local service processing part that connects the a user side; and

a space-division cross module, connected with the transmitting/receiving module and the network identifier module, and is used for performing a space-division cross operation upon the Ethernet service signals;

a network identifier module, which is used for duplicating the Ethernet service signals into two copies, removing the identifier of one copy and sending the signals to the local service processing part, and returning the other copy to the transmission channel of the WDM network through the space-division cross module and transmitting/receiving modules for continuous transmission.

19. The device according to claim 18, wherein, the network identifier module is further used for selecting services that belong to the present station according to self-defined identifiers of the service signals, peeling the identifiers and transmitting the signals to the local service processing part.

20. The device according to claim 18, wherein, the local service processing part comprises a MAC layer and a physical layer, wherein,

the MAC layer receives the Ethernet service signals from the network identifier module, selects the services that belong to the present station to receive according to MAC layer labels in the Ethernet service signals and discarding other services.

21. The device according to claim 18, further comprising:  
an Ethernet service signal encapsulation module, and a mapping/framing module,  
which connects the cross module and the transmitting/receiving modules.